

# HW # 6 (Math 5C 206-7)

21. This is the equation of an ellipsoid:  $x^2 + 4y^2 + 9z^2 = x^2 + \frac{y^2}{(1/2)^2} + \frac{z^2}{(1/3)^2} = 1$ , with  $x$ -intercepts  $\pm 1$ ,  $y$ -intercepts  $\pm \frac{1}{2}$  and  $z$ -intercepts  $\pm \frac{1}{3}$ . So the major axis is the  $x$ -axis and the only possible graph is VII.
22. This is the equation of an ellipsoid:  $9x^2 + 4y^2 + z^2 = \frac{x^2}{(1/3)^2} + \frac{y^2}{(1/2)^2} + z^2 = 1$ , with  $x$ -intercepts  $\pm \frac{1}{3}$ ,  $y$ -intercepts  $\pm \frac{1}{2}$  and  $z$ -intercepts  $\pm 1$ . So the major axis is the  $z$ -axis and the only possible graph is IV.
23. This is the equation of a hyperboloid of one sheet, with  $a = b = c = 1$ . Since the coefficient of  $y^2$  is negative, the axis of the hyperboloid is the  $y$ -axis, hence the correct graph is II.
24. This is a hyperboloid of two sheets, with  $a = b = c = 1$ . This surface does not intersect the  $xz$ -plane at all, so the axis of the hyperboloid is the  $y$ -axis and the graph is III.
25. There are no real values of  $x$  and  $z$  that satisfy this equation for  $y < 0$ , so this surface does not extend to the left of the  $xz$ -plane. The surface intersects the plane  $y = k > 0$  in an ellipse. Notice that  $y$  occurs to the first power whereas  $x$  and  $z$  occur to the second power. So the surface is an elliptic paraboloid with axis the  $y$ -axis. Its graph is VI.
26. This is the equation of a cone with axis the  $y$ -axis, so the graph is I.
27. This surface is a cylinder because the variable  $y$  is missing from the equation. The intersection of the surface and the  $xz$ -plane is an ellipse. So the graph is VIII.
28. This is the equation of a hyperbolic paraboloid. The trace in the  $xy$ -plane is the parabola  $y = x^2$ . So the correct graph is V.